IN THE MATTER OF
KOREAN PATENT APPLICATION
UNDER SERIAL NO. 10-1999-0028811

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THAT I AM CONVERSANT WITH BOTH THE KOREAN AND THE ENGLISH LANGUAGES : AND

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IN THE NAME OF :	LG ELECTRONICS INC.
FOR :	BROADCASTING SERVICE SYSTEM BASED ON MOBILE NETWORK

IN WITNESS WHEREOF, I SET MY HAND HERETO

THIS 22nd DAY OF NOVEMBER, 2006

BY 

Shin Sook LEE

[Translation]

PATENT APPLICATION

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[Translation]

ABSTRACT OF THE DISCLOSURE

[Abstract]

A broadcasting service system using a mobile communication network is disclosed. A television broadcast signal is transmitted based on CDMA or CDMA-2000 of a cellular phone or a PCS or a IMT-2000 mode, and the transmitted television broadcast signal can be watched by a subscriber by using his/her terminal.

Image and voice signals of a television system are controlled to be converted into a format, standard and transmission rate suitable for characteristics of a mobile communication network, and EPG information and supplementary service information are also converted into the format, standard and transmission rate, to thus maintaining a protocol suitable for the mobile communication network. The processed digital image and voice information are transmitted to the subscriber through a certain allocated channel through the mobile communication network. The subscriber can select a channel desired to be watched by using the EPG information, receive broadcast information of the selected channel, and watch it by using his/her terminal.

[Representative drawing]

FIG. 1

[Index words]

TV broadcasting service system, personal mobile communication, mobile communication

[SPECIFICATION]

[Title of the Invention]

BROADCASTING SERVICE SYSTEM USING MOBILE COMMUNICATION NETWORK

[Brief description of the Drawings]

FIG. 1 shows a schematic construction of a broadcasting service system using a mobile communication network;

FIG. 2 is a schematic block diagram showing a broadcasting service system using a mobile communication network according to the present invention;

FIG. 3 shows an example of a format converter according to the present invention;

FIG. 4 shows an example of an EPG conversion processor according to the present invention;

FIG. 5a is a block diagram showing a digital broadcasting service system related to processing of image, voice and supplementary information and matching with the mobile communication network according to the present invention;

FIG. 5b is a block diagram showing an analog broadcast service system related to processing image, voice and supplementary information and matching with the mobile communication network according to the present invention;

FIG. 6 is a block diagram showing a transcoder according to the present invention;

FIG. 7 is a schematic block diagram showing the construction of a mobile terminal according to the present invention; and

FIG. 8 is a view showing the sequential process of controlling a broadcast service according to the present invention.

[Detailed description of the invention]

[Object of the invention]

[Field of the invention and background art]

The present invention relates to a broadcasting service system using a mobile communication network and, more particularly, to a broadcasting service system capable of allowing a user to watch a digital or analog TV broadcast program by using a mobile communication network and a communication terminal based on the mobile communication network such as a cellular phone or PCS, an IMT-2000 CDMA or CDMA-2000, etc.

Currently, the future communication environment is rapidly changing beyond discriminating of wired/wireless regions or area or countries, and in particular, the future communication environment discriminated by IMT-2000 is expected to collectively provide various information required by users in real time as well as images and voices.

In addition, a personal mobile communication system has been developed from the level allowing a simple voice communication in the current cellular phone or PCS, etc., to a level allowing a user to be connected wirelessly with the internet by using a personal mobile communication terminal to obtain various information as well as transmitting text information.

Moreover, for a digital television system for processing video into digital

data and transmitting it, and receiving and displaying it, studies and results for maximizing the advantages of digital information, advancing from a level at which only an image (voice) is simply transmitted, are appearing visually.

In particular, studies for compressing and processing image signals into digital data and transiting a large amount of information at a high speed with a high picture quality in real time are obtaining results and some of them are already being generalized while the other are going to be generalized. Transmission and reception of the digital video information are currently provided to a ground wave broadcast system as well as a satellite broadcast.

However, the related art personal mobile communication system and the existing digital television system are not organically combined or associated for maximizing advantages of the both, but their own functions are individually provided. Namely in case of the digital television system, various supplementary information is provided together with a high quality image to a digital television receiver (can be provided to a PC through the internet according to circumstances) and in case of the personal mobile communication system such as the cellular phone or the PCS merely perform voice call communication and transmit text information.

[Problem to be solved by the invention]

Therefore, one object of the present invention is to provide a broadcasting service system capable of converting a digital or analog broadcast signal into a format suitable for a transmission standard of a mobile communication network in real time, transmitting the converted broadcast signal through a mobile communication network, and allowing a subscriber to watch the broadcast signal

by using his/her terminal.

Another object of the present invention is to provide a broadcasting service system using a mobile communication network wherein when a mobile communication network subscriber requests a broadcast watching, broadcast information is provided through the mobile communication network in response to the request, and a terminal of the corresponding subscriber can receive a digital or analog broadcast signal of a channel selected by the user from the broadcast information through the mobile communication network, whereby the user can watch the television broadcast program of the corresponding channel.

Still another object of the present invention is to provide a subscriber terminal of a broadcasting service system using a mobile communication network capable of allowing a mobile communication network subscriber to watch a digital or analog television broadcast program by using a terminal by including a unit for selecting a broadcast signal, receiving and restoring the broadcast signal selected by the user, and a unit for outputting it as images or in voice.

[Construction of the invention]

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a broadcasting service system using a mobile communication network including: a unit for receiving image and voice signals provided from video resource and converting the image and voice signals into signals of a mobile communication network and a form suitable for its transmission standard; and a unit for transmitting the converted image and voice signals to a subscriber through a certain transmission line (channel) of the mobile communication

network.

In the present invention, the video resource can be an analog television broadcast signal or a digital television broadcast signal.

In the present invention, the image and voice resource follows a first signal standard suitable for television broadcasting, the digital image and voice resource converted suitably for the mobile communication network follows a second signal standard, and the first and second signal standards follow signal standards that can be mutually converted between different systems.

In the present invention, the image and voice resource follows a first signal format suitable for a transmission of digital data and the digital image and voice resource converted suitably for the mobile communication network follows a second signal format, and the first and second signal formats follow signal standards that can be mutually converted between different systems.

In the present invention, the image and voice resource follows a third signal format suitable for analog television broadcasting, and a unit for converting from the third signal format to the second signal format is included.

In the present invention, the first signal format follows an MPEG2, the second signal format may follow MPEG4, H.26L, H.263, H.26X, and the third signal format may follow an analog television broadcast signal format.

In the present invention, the unit for converting the digital image and voice resource into a form suitable for the mobile communication network includes at least a unit for formatting digital image and voice data which has been coded suitably for the digital television broadcast system so as to be suitable for a transmission of the mobile communication network, and coding it, and a unit for converting and controlling a transmission rate so as to be suitable for a

transmission rate of the mobile communication network.

In the present invention, the unit for converting the digital image and voice resource to a form suitable for the mobile communication network includes: a unit for converting the analog image and voice signal which has been formatted suitably for the analog television broadcasting system into a digital signal; a unit for formatting the image and voice signal which has been converted into the digital signal suitably for the mobile communication network transmission and coding it; and a unit for converting and controlling a transmission rate so as to be suitable for a transmission rate of the mobile communication network.

The unit for transmitting the television image and voice signal which has been converted into the form suitable for the mobile communication network to a subscriber through a certain transmission line includes: a unit for putting the formatted and transmission rate-controlled digital image and voice data to the transmission line and a unit for formatting the television broadcast information added to the digital image and voice data together and transmitting them.

In the present invention, as the television broadcast information added to the digital image and voice data, EPG (Electronic Program Guide) data is also formatted and carried on the mobile communication network.

In the present invention, the unit for converting the television image and voice signal into the form suitable for the mobile communication network transmits the television image and voice signal to a corresponding subscriber through a wireless communication line connected between the mobile communication subscriber and a base station.

In the present invention, the unit for transmitting the television image and voice signal to the mobile communication network allocates at least one line and

transmitting the television image and voice signal through the allocated dedicated line.

In the present invention, the television system includes: a unit for discriminating a subscriber for receiving the television image and voice signal among mobile communication subscribers, and a unit for charging a fee corresponding to reception of the image and voice of the discriminated specific subscriber.

In the present invention, the television system using mobile communication includes: a unit for receiving digital image and voice data provided through a mobile communication network; a unit for decoding the received digital image and voice data; a unit for outputting the decoded digital image and voice data; a unit for receiving EPG data as supplementary information of the received digital image and voice data and reading and outputting it; a unit for controlling receiving of the digital image and voice data in response to a request of a mobile communication subscriber corresponding to the EPG data; and a unit for inputting a response of the mobile communication subscriber corresponding to the EPG data to the controlling unit.

In the present invention, a broadcasting service system using a mobile communication network includes: transmitting EPG data to a subscriber through a mobile communication network in response, when a mobile communication subscriber requests a broadcast service; searching the transmitted EPG data and selecting a channel desired to be watched; receiving the selected channel information from a server, carrying voice and image data of the corresponding channel in an allocated mobile communication network channel and transmitting it.

In the present invention, a mobile terminal can be one of a PCS terminal and an IMT-2000 terminal.

The construction and operation of the present invention will now be described with reference to the accompanying drawings. The construction and operation of the present invention illustrated and explained in the drawings are described as at least one example and a technical idea and its core parts of construction and operation are not limited thereto.

Thus, in the present invention, the elements of the television system using mobile communication system as described above can be easily and effectively modified by a person skilled in the art.

FIG. 1 shows a schematic construction of a broadcasting service system using a mobile communication network. The system shown in FIG. 1 is an example of application of the present invention to a cellular network.

A television (TV) broadcasting system 101 transmits image and voice signals to a subscriber terminal 104 through a satellite network 102, a ground wave broadcasting network 103 or a cable, and the subscriber terminal 104 receives them, properly decodes them, and outputs a voice and images.

Herein, the television broadcasting system 101 as video (and voice) resources can be an analog television broadcasting system or a digital television broadcasting system, or can be any other video resources.

Currently, for the analog broadcasting field, broadcasting schemes such as NTSC, PAL or SECAM have been proposed and commercialized, and for the digital broadcasting field, there are American ATSC (Advanced Television Systems Committee) method, European DVB (Digital Video Broadcasting) method and a Japanese digital broadcasting method. Herein, the ATSC adopts

an MPEG2 (image compression), Dolbi AC3 (voice compression) and an 8VSB (transmission standards), and the European DVB method adopts an MPEG2 (image and voice compression) and an OFDM (transmission method). In Republic of Korea, ATSC method is adopted as ground wave broadcasting and the DVB method is adopted as the satellite broadcasting.

The digital television broadcasting system provides image and voice signals as the form of compressed digital data (bit streams), in which proper protocols related to transmission and reception are defined and digital broadcast information of a format satisfying the protocols and various other supplementary information including image and voice data and EPG data are processed.

A case of processing of an MPEG2-compressed digital image signal will now be described as an example shown in FIG. 1.

When the television broadcasting system 101 is a digital television broadcasting system, image resources provided in the system are resources compressed and coded in the standards of MPEG2, so a format converter 105 for converting the compressed and coded resources into an MPEG4 as an image standard suitable for a mobile communication network is provided.

When the television broadcasting system 101 is an analog television broadcasting system, the system may include a unit for converting the provided image resources into digital signals and converting it into a certain format suitable for its transmission to the mobile communication network (video resource provider), or the format converter 105 may have the unit.

In case of the former case, the format converter 105 receives MPEG image resources provided from the television broadcasting system 101 and converts its format into an MPEG4 suitable for the mobile communication

network. The latter case will be described with reference to FIG. 5b.

In case of the former case, the format converter 150 can convert the MPEG2 image resources into formats of H.26L, H.263 or H.26X.

A format suitable for network characteristics of the mobile communication network can be selected and performed and the formats are not limited.

The format converter 105 exchanges general information required for the formation conversion through a line 107 with the television broadcasting system 101.

The format converter 105 will now be described in detail.

For example, as a bit rate used in a digital television, an HD class of 10.236Mbps or an SD class of 6Mbps is used as a fast broadcast band.

The data transmission rate of the IMT-2000 is a maximum 2Mbps (in case of a pico cell) according to a cell, so the mobile communication network for processing signals of a maximum 2 Mbps bi-directionally cannot transmit the digital television signal to the cellular phone (or PCS) due to different network characteristics.

Thus, the digital television signal of the MPEG2 needs to be format-converted to a signal suitable for the mobile communication network such as MPEG4, for which, thus, the format converter 105 handles transcoding image and voice data, formats program guide information (EPG information) among the digital television information and other supplementary information so as to be converted into signals suitable for the mobile communication network and follow the standard of the mobile communication network.

In order to transmit the converted digital image and voice data and information to the mobile communication network, they are provided through a

line 109 to the MTSO (System Controller and Switch) 108, the MTSO 108 provides a signal for responding to a request from a subscriber through the line 110 to the format converter 105, and allocates the digital image and voice information to a certain channel of the mobile communication network and transmits them as RF signals to a subscriber terminal 112 by way of a base station 111.

By converting the image and voice signals of the television broadcasting system 101 into signals and standards suitable for the mobile communication network and providing them to the subscriber terminal 112 through the mobile communication network, an environment allowing a user to watch the television broadcasting through the mobile terminal (cellular phone, PCS or IMT-2000 terminal).

FIG. 2 is a schematic block diagram showing the broadcasting service system using the mobile communication network according to the present invention, particularly showing a system including the format converter 105, the MTSO 108 and the base station 111.

When video resource is a digital television broadcast system, a television receiving unit 201 receives digital image and voice data corresponding to the digital television broadcast system and supplementary information including EPG from the digital television broadcasting system and transmits an MPEG2 signal to the transcoder 202, extracts the EPG data and transmits it to an EPG conversion unit 203, and extracts the supplementary data and transmits it to a supplementary data conversion unit 204.

The transcoder 202 converts the inputted MPEG2 digital image and voice data into MPEG4 digital image and voice data and transmits them to a channel

multiplexer 205.

That is, as transmission mediums of the digital image data is diversified, a bit rate or a modulation method of the digital image needs to be adaptively adjusted to characteristics of a medium because of a difference of transmission characteristics and bandwidth between mediums, and in this respect, in the present invention, signals of the digital television broadcasting system are provided to a mobile communication subscriber terminal such as the cellular phone or the PCS through the mobile communication network. In which in order to transmit the digital image data through a medium having a different bandwidth, the transcoding is applied as a method for changing a previously compressed bit stream to a different bit stream.

The EPG conversion unit 203 decodes EPG data in the inputted MPEG2 standard, interprets it, and converts it into EPG data format corresponding to the MPEG4.

The supplementary data conversion unit 204 decodes the supplementary data in the inputted MPEG2 standard, interprets it, and converts it into a supplementary data format corresponding to the MPEG4.

As for the EPG conversion and supplementary data conversion, the data can be converted into a format suitable for the wireless internet network so as to be transmitted.

The channel multiplexer 205 carries the MPEG4 image and voice data provided from the transcoder 202 in a certain allocated channel of the mobile communication network, and also carries the EPG data outputted from the EPG conversion unit 203 and the supplementary data outputted from the supplementary data conversion unit 204 in a certain allocated channel.

In this manner, the data are processed and converted into the MPEG4 standard, and the supplementary information including the digital television image and voice signal which have been format-converted according to the network characteristics of the mobile communication network and the EPG information are transmitted to the subscriber terminal through the RF transmitter 206.

Herein, the RF transmitter can correspond to the MTSO or the base station in the mobile communication network.

In case of the MPEG2, an SD class requests 6Mbps band and HD class requires about 19Mbps band, so when they are converted into the MPEG4, a video at a bit rate of about 64 kbps can be allocated a portion of an IMT-2000 band as a television broadcasting band and transmitted.

In case of transmitting video information as packets so as to transmit video information to a dedicated broadcasting channel (communication line), when the characteristics of the mobile communication network are considered, band occupied by a voice can be variable according to a traffic amount of a subscriber in a single base station, and in this case, because television broadcast information cannot assume within a limited band, a technique for variably controlling band allocation is required.

When a video band (including voice) for digital television broadcasting is BW_video and a band for voice communication of the mobile terminal is BW_audio, a size of the voice band occupies from 0 to a maximum BW_audio according to voice traffic amount.

Accordingly, the channel multiplexer 205 provides voice traffic amount information to the transmission rate controller 207 according to the voice traffic

amount, and the transmission rate controller 207 controls an encoding rate of the MPEG4 of the transcoder 202 by using the information.

In addition, as stated above, the digital television broadcasting can provide supplementary service as well as image and voice, the supplementary information is provided to the subscriber through the supplementary data conversion unit 204 and the channel multiplexer 205.

FIG. 3 shows an example of a format converter according to the present invention, especially showing the construction of a format conversion system including the transcoder, the EPG data conversion unit and the data service conversion processor.

Namely, the format converter 302 for converting a signal inputted from the television broadcasting system 301 into a signal and standard suitable for the mobile communication network 303 includes an A/V stream transcoder 304 for receiving the a/vi stream provided from the television broadcasting system and converting it into a format suitable for the mobile communication network; an EPG conversion processor 305 for receiving an EPG stream provided from the television broadcasting system and converting it into a format suitable for the mobile communication network; and a data service conversion processor 306 for receiving a data stream provided from the television broadcasting system and converting it into a format suitable for the mobile communication network.

The A/V stream transcoder 304 converts digital image (including voice0 resources of the MPEG2 inputted from the television broadcasting system into a format of the MPEG4 or H.26L, H.263 and H.26X and provides them to the mobile communication network 303.

In this case, the format-converted digital image data can be provided in

response to a subscriber request (A/V RQ) of the mobile communication network 303.

The EPG conversion processor 305 converts the EPG stream of the MPEG2 inputted from the television broadcasting system into the signal format suitable for the mobile communication network as described above. FIG. 4 shows detailed construction of the EPG conversion processor 305.

The EPG conversion processor 305 receives EPG information, namely, information from PSIP table, performs format-decoding thereon, filters required information such as a program name or a bit transmission rate to extract required information, and format-converts the extracted information to satisfy a wireless data protocol.

Herein, as for the format-conversion, in case of a WAP (Wireless Application Protocol), PSIP text is converted into an HDML (Handheld Device Mark-up Language) or a TTML (Tagged Text Mark-up Language), and in case of a wireless data protocol, PSIP is converted into an HDTP (Handheld Device Transport Protocol) or an ITTP (Intelligent Terminal Transfer protocol).

As shown in FIG. 4, there are provided an EPG analyzer 401, an EPG response controller 402, a schedule database 403 and a protocol converter 404. The EPG analyzer 401 analyzes an inputted EPG stream according to an encoded format to extract schedule-related information of channel-related information and broadcast programs, and stores the result in the schedule database 403.

The schedule database 403 records/stores information inputted from the EPG analyzer 401 in a memory, and searches particular information in the database in response to a request from the EPG response controller 420 and

outputs it.

The EPG response controller 420 is operated in response to the EPG response request (EPG RQ) from a user, searches content corresponding to the user request from content of the schedule database 403 and transmits it to the protocol converter 404.

The protocol converter 404 converts data inputted from the EPG response controller 402 into a format that can be recognized by the MTSO and outputs it so that the subscriber can receive the EPG information from the digital television broadcasting system by the mobile terminal, and copes with a response of the subscriber.

The data service conversion processor 306 in FIG. 3 receives supplementary information (data stream) from the television broadcasting system 301, converts them into a format suitable for the mobile communication network, and provides the corresponding information in response to the subscriber request (data RQ) through the MTSO 303.

Namely, the data service conversion processor 306 performs the process of converting the contents of the broadcast data standard of the digital television and the broadcast protocol so as to be suitable for the mobile communication network.

For example, service information of the digital television broadcasting system are decoded by using a presentation engine such as an MHEG-5 engine or an XHTML browser and performs contents format conversion and protocol conversion on the decoded information so as to follow the signal and format suitable for the mobile communication network.

Herein, in case of converting into a wireless internet WAP, a carousel/IP

datagram follows HDTP and MHEG/XHTML follows HDML.

FIG. 5a shows an embodiment of the digital broadcasting service system using mobile communication according to the present invention, and FIG. 5b shows an embodiment of the analog broadcast service system using mobile communication according to the present invention.

The digital television broadcasting system using mobile communication as shown in FIG. 5a will now be described.

The digital television broadcasting system using mobile communication includes a digital signal processor 501, a medium storage unit 502, a data processing/converting unit 503, and a transcoder/transmission unit 504.

The digital signal processor 501 serves as a resource program transmission unit for receiving 19.2Mbps HD class and 6Mbps SD class multi-channel digital television signals and supplying a broadcast program to the mobile communication network.

The digital signal processor 501 selects an inputted digital television signal from a tuner 505, demodulates the selected signal in a demodulator 506, extracts information according to each broadcast channel in a demultiplexer 507, and reproduces voice and image signals by an MPEG decoder 507 into their original broadcast signals and outputs them.

Herein, data for providing PSI (Program System Information), guide information and supplementary information are extracted by an MPEG TP demultiplexer 507.

The medium storage unit 502 includes an MPEG recorder 502, an MPEG file input/output unit 502b and a file filter 502c, and is a file system that adjusts disk scheduling for simultaneously storing maximum 30Mbps class MPEG

streams in real time according to a digital television broadcast signal and data block size according to the MPEG2 stream, and also directly stores the stream such as MPEG4 therein and provides it to the mobile communication network.

Herein, in order to store the MPEG2 transmission stream transferred from the digital television broadcast signal receiving unit by continuous blocks, a striping scheme is used, and in order for the transcoder 513 to effectively calculate a bit rate drop, a macro block and intra/inter compensation, the file system can directly support a GOP unit and an I-frame value.

The data processing/converting unit 512 includes an EPG decoder 509, a data decoder 510, a presentation engine unit 511 and a protocol conversion unit 512, and as mentioned above, it is a module for extracting required information and converting it so that the mobile terminal user can use the EPG information and the supplementary information received from the digital television broadcasting.

The EPG decoder 509 extracts EPG data from data inputted from the digital signal processing unit 501 and decodes it. The decoded data is format-converted by a presentation engine unit 511 and inputted to the protocol conversion unit 512.

Herein, as for the format conversion, as mentioned above, in case of the wireless WAP, the PSIP text is converted into HDML and TTML, and in case of the wireless data protocol, PSIP is converted into the HDTP and ITTP.

The data decoder 510 extracts supplementary service information from data inputted from the digital signal processing unit 501 and decodes it. The decoded information is format-converted by the presentation engine unit 511 and inputted to the protocol conversion unit 512.

Herein, in case of converting into the wireless Internet WAP, the Carousel/IP datagram follows the HDTP and the MHEG/XHTML follows the HDML.

The protocol conversion unit 512 converts supplementary information including the EPG data which has been format-converted to be suitable for the mobile communication network into a protocol suitable for the mobile communication network and outputs it.

The transcoder 513 converts the digital image (including voice) signals of a broadcast standard inputted from the digital signal processor 501 into a standard suitable for the mobile communication network, for example, from the MPEG2 into the MPEG4, and provides the converted digital image and voice data to the wireless data stream processing unit 517 under the control of a transmission rate of the transmission rate controller 516.

The analog television broadcasting system using mobile communication as shown in FIG. 5b will now be described.

The analog television broadcasting system using mobile communication includes an analog signal processor 518, a medium storage unit 502, a data processing/converting unit 503, and a transcoder/transmission unit 504.

The medium storage unit 502, the data processing/converting unit 503 and the transcoder/transmission unit 504 are the same as those shown in FIG. 5a.

The analog signal processor 518 includes an analog broadcast signal receiving unit 519, an analog digital converter 520, an MPEG4 encoder 521, and a VBI extracting unit 522.

The analog signal processing unit 518 serves as a resource program transmission unit for receiving an analog television signal and providing a

broadcast program to the mobile communication network.

In the analog signal processor 518, the receiving unit 519 receives and restores the inputted analog television signal, the analog digital conversion unit 520 converts the restored analog broadcast signal (including video and voice information) into digital data, an MPEG4 encoder (H.-based encoder) converts the digital data into an MPEG4 format and provides it to the transcoder and transmission unit 504, and the VBI extracting unit 522 extracts EPG data and supplementary data carried on an VBI interval and provides them to the EPG decoder 509 and the supplementary data decoder 510.

The follow-up signal processing is the same as shown in FIG. 5a.

In this manner, the broadcast service using mobile communication can be provided even when the video services are the analog television broadcast signals.

One example of the transcoder 513 is shown in FIG. 6.

The circuit in FIG. 6 shows a case of converting the MPEG2 into the MPEG4, and the present invention is not limited thereto.

Namely, as mentioned above, when the digital image and voice data formats suitable for the mobile communication network are H.26L, H.263 and H.26X, a circuit and an algorithm for converting into the formats can be constructed.

As stated above, in order to transmit the television broadcast signal in real time by using the wireless communication network, the signal should be fit the characteristics of the wireless communication network, for which the transcoding is performed between the different systems. In this case, in order to prevent degradation of picture quality, a suitable transcoding method can be selected

from transcoding methods that are widely studied, and used.

In addition, without having to perform transcoding on the digital television broadcast resources, the resources can be directly transmitted by using the MPEG4 or H.263-based digital compression algorithm.

FIG. 6 shows a circuit in which when an MPEG2 bit stream is inputted, a decoder unit 601 decodes it and an encoder unit 602 encodes the decoded restored digital image data into the MPEG4 bit stream.

Image data decoded in a variable length coding decoder VLD 633 of the decoder unit 601 is dequantized and IDCT-transformed through a dequantization unit 604 and an inverse DCT unit 605, which is then subjected to a motion compensation process of an output unit including an adder 606, a memory 607 and a motion compensation unit 608 so as to be perfectly decoded into their original images.

The restored digital image data is encoded according to a quantization step (the quantization step of the encoder is greater than the quantization step of the decoder because the MPEG2 is converted into the MPEG4) different from the quantization step of the decoding operation by the encoder unit 602 to thus output MPEG4-coded digital compressed image data.

In the encoder unit 602, a DCT unit 610 performs DCT on a difference between the input image which has been outputted through an adder 609 and restored image, and a quantization unit 611 performs quantization to output a coded MPEG4 bit stream through a variable length coder 612. The data outputted from the quantization unit 611 is restored through a dequantization unit 613 and an inverse DCT unit 614. The restored image is subjected to processes of an adder 615 and a memory 616 and a motion compensation process in a

motion compensation unit 617 to obtain a difference from the input image data, on which the DCT and quantization are performed to compress the digital image data.

The thusly transcoded data is inputted to the transmission rate controller 516 in FIGs. 5a and 5b, adaptively controlled at a transmission rate suitable for the environment of the mobile communication network, and then inputted to the wireless network stream processing unit 517.

The wireless network data protocol processing unit 515 indicates a data protocol that can be processed in the mobile communication network with respect to the EPG data and the supplementary data outputted from the protocol conversion unit 512 of the data processing/converting unit 503 as mentioned above, which can be, for example, the HDTP and ITTP in the WAP.

The wireless data protocol processing unit 515 performs a function of easily navigating a corresponding program schedule and an outline in the database of the presentation engine unit 511 when the mobile terminal requests searching for a corresponding broadcast time by sending a particular keyword (e.g., a program name and an actor, etc.).

A medium synchronization controller 514 re-configures synchronization between the voice and image data which have been transcoded by the transcoder 513 and the data which has been converted by the data processing/converting unit 503, or directly provides data which does not need synchronization to the wireless stream processing unit 517.

Namely, the medium synchronization controller 514 re-synchronizes data broadcast contents synchronized with the voice and image data so as for synchronization information which has been lost while passing through the

transcoder 513 to be closest voice and image data.

As mentioned above, the digital image, voice and supplementary information re-configured into the signals and format suitable for the mobile communication network are inputted to the wireless stream processing unit 517.

The wireless stream processing unit 517 transmits video and data to be transmitted to the mobile communication network simultaneously to the corresponding channel in real time, and allocates or releases a channel related to transmission of the digital television signal according to a subscriber request and in response thereto.

FIG. 7 shows the television system using mobile communication according to the present invention, and especially showing the construction of a subscriber terminal that can receive a television signal transmitted through the mobile communication network.

Bi-directional wireless communication is performed with a base station through an antenna 701.

An RF transceiver 702 transmits/receives a base station communication signal received through the antenna and a signal for voice call communication, and receives a television broadcast signal transmitted to a corresponding traffic channel.

In case of performing voice call communication, a voice coding and decoding unit 703 decodes a voice signal of the other party which has been received through the RF transceiver 702 and provides it to the voice processing unit 706 so as to be outputted through a speaker SP, and a voice signal inputted from the voice processing unit 706 through a microphone MIC of the user is coded and transmitted through the RF transceiver 702.

The image coding and decoding unit 704 performs a function of the MPEG4 decoder, and in the present invention, the MPEG4 decoder is formed to reproduce image data transmitted through the mobile communication network after being transcoded into the MPEG4, but in case of IMT-2000, the H.263 coded can be constructed according to an environment of the mobile communication network.

Namely, according to various coding methods that process video resources into a format suitable for the mobile communication network, the coded of various coding standards can be constructed accordingly.

When a television broadcasting is received, the image coding and decoding unit 704 receives the MPEG4 digital image signal inputted from the RF transceiver 702 and decodes it, and the restored television image signal is outputted to a monitor 708 through an image processing unit 707.

In case of a mobile communication system that supports a two-way image communication function, a camera 705 transits a signal obtained by capturing an image of the user through the image processing unit 707, the image coding and decoding unit 704 and the RF transceiver 702.

A processor 709 includes a voice call mode and a television reception mode, controls each element properly according to each mode, and reads required information from the memory unit 710 or stores them.

A key input unit 711 has a key input function for a telephone call and is allocated key defined for receiving television programs.

FIG. 8 is a view showing the sequential process of receiving a broadcast signal between the terminal in FIG. 7 and the broadcasting service system using mobile communication according to the present invention.

A case where EPG data is transmitted to a subscriber in response a corresponding request from the subscriber, and a format-converted signal with respect to a program selected by the subscriber base don the EPG data is transmitted through a channel maintained with the corresponding subscriber will now be described with reference to FIGs. 7 and 8.

It is assumed that the subscriber is charged, which means that the subscriber has an authority to receive and watch a digital television broadcast program, a mobile communication server (provider) has a phone number previously defined for processing the subscriber request, has a password previously defined for confirming the subscriber and performs an authentication procedure.

First, when the subscriber of the mobile terminal wants to receive a digital television broadcast program through a subscribed mobile communication network, the subscriber sets a TV mode by using the key input unit 711 and is connected with the phone number defined with the server (of the mobile communication provider) (requesting communication line).

When the connection is successful, it is checked whether the subscriber has an authority to receive the digital television broadcast by using a password inputted by the subscriber.

When the subscriber has the authority to receive the digital television broadcast signal, authentication is performed (access grant) and a dedicated line (channel) is allocated to allow the subscriber to watch video.

The MTSO requests EPG data from the format converter.

In response to the request of the EPG data, the format converter provides an EPG data packet to the MTSO and the MTSO transmits the EPG packet to

the subscriber through the communication channel maintained with the subscriber.

Herein, the EPG packet data can be transmitted in a format suitable for the wireless internet and received.

The EPG data packet which has been received by the antenna 701 is decoded in the image coding and decoding unit 704 through the RF transceiver 702, and the decoding result is displayed on a monitor 708 through the image processing unit 707.

In response, the user searches the EPG data and selects a channel to be watched.

In order to allow the user to search the EPG data and select a channel desired to be watched, the terminal (processor) includes a web browser unit and searches even supplementary information as well as EPG data by using the browser unit.

The channel select information desired to be viewed is inputted to the processor 709 through the key input unit 711, and the processor 709 codes the corresponding signal and transfers it to the server through the RF transceiver 702 and the antenna 701.

The server (MTSO) requests voice and image data corresponding to the channel desired to be watched by the user from the format converter, and the format converter outputs corresponding voice and image data to the subscriber through the mobile communication network.

The thusly transmitted television broadcast signal is inputted to the image coding and decoding unit 704 through the antenna 701 and the RF transceiver 702, and as mentioned above, the image coding and decoding unit 704 serves

as the MPEG4 decoder as described above to decode the received broadcast program and output the image and voice to the monitor 708 and the speaker SP through the processing units 707 and 706 so that the user can watch the television broadcasting by using the mobile communication network.

After the user authentication is performed, charging for the broadcasting program watched by the user can be performed by the server by using a user authentication password as an ID.

Herein, the television broadcast signal is transmitted with respect to the particular (variable channel) maintained between the user and the subscriber, but the present invention is not limited thereto and a particular channel can be allocated for the television broadcasting and the television system using the mobile communication can be implemented.

[Effect of the invention]

The broadcasting service system using the mobile communication network according to the present invention has the following advantages.

That is, first, the user can watch video by using the mobile communication network, and regardless of the analog television broadcast signal and the digital television broadcast signal as the video resources, the environment in which the user can watch each television broadcast signal by using the mobile terminal can be provided.

Second, the subscriber can watch a desired television broadcast program by using the mobile terminal such as the cellular phone, the PCS or the IMT2000 terminal.

Third, the EPG data can be transmitted in response to a request of the

subscriber, and the broadcast program desired to be watched by the subscriber can be provided in real time.

What is claimed is:

1. A broadcasting service system using a mobile communication network comprising: a unit for receiving image and voice signals provided from video resource and converting the image and voice signals into signals of a mobile communication network and a form suitable for its transmission standard; and a unit for transmitting the converted image and voice signals to a subscriber through a certain transmission line (channel) of the mobile communication network.

2. The system of claim 1, wherein the image and voice resource follows a first signal standard suitable for television broadcasting, the digital image and voice resource converted suitably for the mobile communication network follows a second signal standard, and the first and second signal standards follow signal standards that can be mutually converted between different systems.

3. The system of claim 2, wherein the first signal format follows an MPEG2, and the second signal format may follow MPEG4, H.26L, H.263, and H.26X.

4. The system of claim 1, wherein the unit for converting the digital image and voice resource into a form suitable for the mobile communication network includes at least a unit for formatting digital image and voice data which has been coded suitably for the digital television broadcast system so as to be suitable for a transmission of the mobile communication network, and coding it, and a unit for converting and controlling a transmission rate so as to be suitable for a

transmission rate of the mobile communication network.

5. The system of claim 1, wherein the unit for converting the digital image and voice resource to a form suitable for the mobile communication network includes: a unit for converting the analog image and voice signal which has been formatted suitably for the analog television broadcasting system into a digital signal; a unit for formatting the image and voice signal which has been converted into the digital signal suitably for the mobile communication network transmission and coding it; and a unit for converting and controlling a transmission rate so as to be suitable for a transmission rate of the mobile communication network.

6. The system of claim 1, wherein the unit for transmitting the television image and voice signal which has been converted into the form suitable for the mobile communication network to a subscriber through a certain transmission line includes: a unit for putting the formatted and transmission rate-controlled digital image and voice data to the transmission line and a unit for formatting the television broadcast information added to the digital image and voice data together and transmitting them.

7. The system of claim 1, wherein, as the television broadcast information added to the digital image and voice data, EPG (Electronic Program Guide) data is also formatted and carried on the mobile communication network.

8. The system of claim 1, wherein the unit for converting the television image and voice signal into the form suitable for the mobile communication

network transmits the television image and voice signal to a corresponding subscriber through a wireless communication line connected between the mobile communication subscriber and a base station.

9. The system of claim 1, wherein the unit for transmitting the television image and voice signal to the mobile communication network allocates at least one line and transmitting the television image and voice signal through the allocated dedicated line.

10. The system of claim 1, wherein the television system comprises: a unit for discriminating a subscriber for receiving the television image and voice signal among mobile communication subscribers, and a unit for charging a fee corresponding to reception of the image and voice of the discriminated specific subscriber.

11. A mobile terminal comprising:

a unit, as a receiving unit of a broadcasting service system using mobile communication, for receiving digital image and voice data provided through a mobile communication network;

a unit for decoding the received digital image and voice data; and

a unit for outputting the decoded image and voice signal.

12. The terminal of claim 11, further comprising:

a unit for receiving an EPG signal from a broadcast signal transmitted through the mobile communication network and decoding it; and

a unit for transmitting a user search response of the decoded EPG data to the service system.

13. The terminal of claim 11, wherein the mobile terminal is one of a cellular phone, a PCS terminal or an IMT-2000 terminal.

14. The terminal of claim 11, further comprising:

a web browser unit for searching the EPG data and supplementary information transmitted through the mobile communication network.

15. A broadcasting service system using a mobile communication network comprising:

a digital image and voice input unit for receiving a digital image and voice signal as a digital broadcast signal from a provider of corresponding resources;

a transcoding unit for converting the digital image and voice signal inputted from the input unit into a format and a transmission rate suitable for the mobile communication network; and

a unit for allocating the digital broadcast signal, which has been converted into the format and transmission rate suitable for the mobile communication network, to a certain channel, and carrying it in the channel and transmitting it.

16. The system of claim 15, further comprising:

a unit for converting EPG data for selecting a digital broadcast channel into a format suitable for the mobile communication network; and

a unit for converting the information added to the digital broadcast into a

format suitable for the mobile communication network.

17. The system of claim 16, wherein the EPG data and the supplementary information are transmitted in a format suitable for a wireless Internet.

18. The system of claim 16, wherein the EPG conversion unit comprises:

a unit for receiving an EPG stream of the digital broadcasting and decoding it;

a unit for interpreting the decoded EPG data and restoring it;

a database unit for storing corresponding information based on the restored EPG data;

a unit for outputting EPG information from the database in response to a subscriber request; and

a unit for converting the outputted EPG data according to a standard of the mobile communication network.

19. A broadcasting service system comprising:

a digital signal processing unit for receiving a digital broadcast signal and providing a broadcast program to a mobile communication network;

a medium storage unit for storing broadcast information processed in the digital signal processing unit;

a data processing and converting unit for converting the EPG data processed in the digital signal processing unit and supplementary information into a signal format suitable for the mobile communication network; and

a transcoder and transmission unit for receiving the voice and image data

processed in the digital signal processing unit, converting them into signal formats suitable for the mobile communication network, and outputting them.

20. The system of claim 19, wherein the digital signal processing unit comprises:

a tuner for selecting an inputted digital broadcast signal by using a transmission medium such as skywave broadcasting, satellite broadcasting, and cable broadcasting;

a demodulation unit for restoring the selected digital broadcast signal;

a demultiplexer for extracting the EPG information and the supplementary information from the demodulated digital broadcast signal; and

a decoder for decoding voice and image signals from the demodulated digital broadcast signal.

21. The system of claim 19, wherein the data processing and converting unit comprises:

a unit for decoding EPG data of the digital broadcasting;

a unit for converting the decoded EPG data into a signal format suitable for the mobile communication network;

a unit for converting the converted EPG data into a protocol suitable for the mobile communication network;

a unit for decoding the supplementary information of the digital broadcasting;

a unit for converting the decoded supplementary information into a signal format suitable for the mobile communication network; and

a unit for converting the converted supplementary information into a protocol suitable for the mobile communication network.

22. The system of claim 19, wherein the transcoder and transmission unit comprises:

a transcoder for converting the image and voice signals of the digital broadcasting into a format of the mobile communication network;

a transmission rate controller for controlling an output of the transcoder with a transmission rate suitable for an environment of the mobile communication network;

a unit for converting an output of the data processing and converting unit into a format suitable for a data protocol of the mobile communication network;

a unit for performing synchronizing on information required to be synchronized in the transcoding and protocol conversion; and

a unit for allocating final data, which have been format-converted, subjected to the transmission rate controlled, protocol-converted, and synchronized, to a certain channel of a wireless communication network, and transmitting them in real time.

23. A broadcasting service method using a mobile communication network comprising:

converting a broadcast signal including digital image and voice data into a signal of a mobile communication network and a form suitable for its transmission standard; and

transmitting the digital image and voice data which have been converted

to be suitable for the mobile communication network to a subscriber through a certain transmission line (channel).

24. The method of claim 23, wherein the format converting step comprises:

converting the image and voice data of the digital broadcast signal into a standard and transmission rate of the mobile communication network; and

converting EPG data and supplementary information of the digital broadcast signal suitably according to the standard and transmission rate of the mobile communication network, and

the transmission step comprises:

performing synchronization on an element required to be synchronized with respect to the converted digital image and voice data, the EPG data and the supplementary information; and

converting the data according to a protocol of the mobile communication network; and

allocating the digital data following the protocol of the mobile communication network to a channel and carrying them in the channel.

25. A broadcasting service method comprising:

transmitting EPG data to a subscriber through a mobile communication network in response when the subscriber of the mobile communication network requests a broadcasting service;

searching the transmitted EPG data and selecting a channel desired to be watched;

communication network and transmitting it to a subscriber.

29. The system of claim 28, further comprising:

a unit for extracting an EPG signal and supplementary information from the broadcast signal received by the analog broadcast receiving unit; and

an encoding converting unit for converting the extracted EPG signal and the supplementary information into a signal and format suitable for the mobile communication network, to thereby transmitting the EPG and supplementary information to the subscriber together with video information.

30. The system of claim 28 or 29, wherein the encoding converting unit directly encodes the analog/digital-converted broadcast signal into a format suitable for the transmission characteristics of the mobile communication network such as MPEG4, H.26L, H.263, H.26X and carries it on a transmission line.

Fig.1

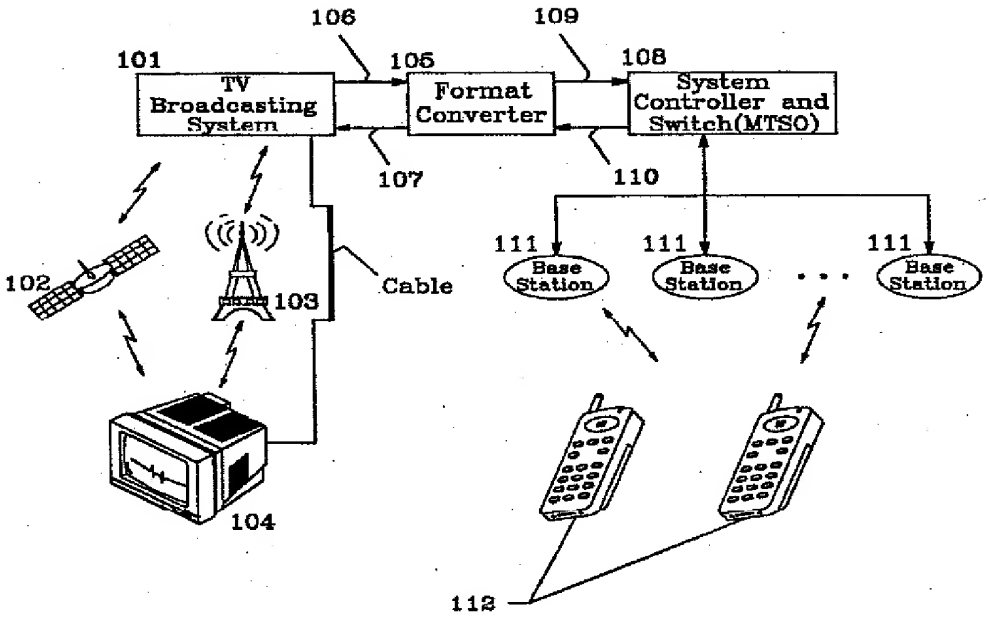

106
109
101
105
108
TV Broadcasting System
Format Converter
System Controller and Switch(MTSO)
107
110
111
111
111
Base Station
Base Station
Base Station
102
103
Cable
104
112

Fig.2

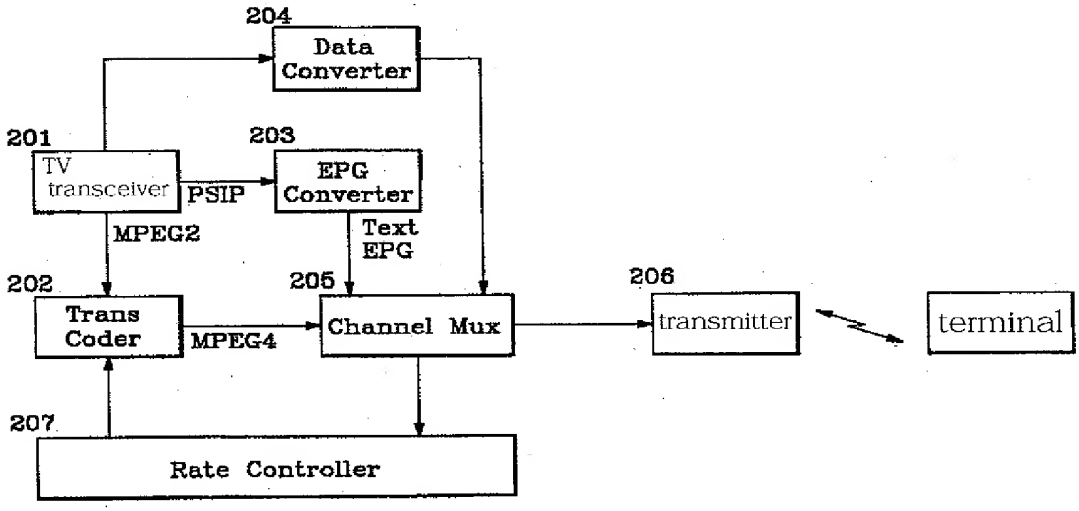

204
Data Converter
201
203
TV transceiver
PSIP
EPG Converter
MPEG2
Text EPG
202
205
206
Trans Coder
MPEG4
Channel Mux
transmitter
terminal
207
Rate Controller

Fig.3

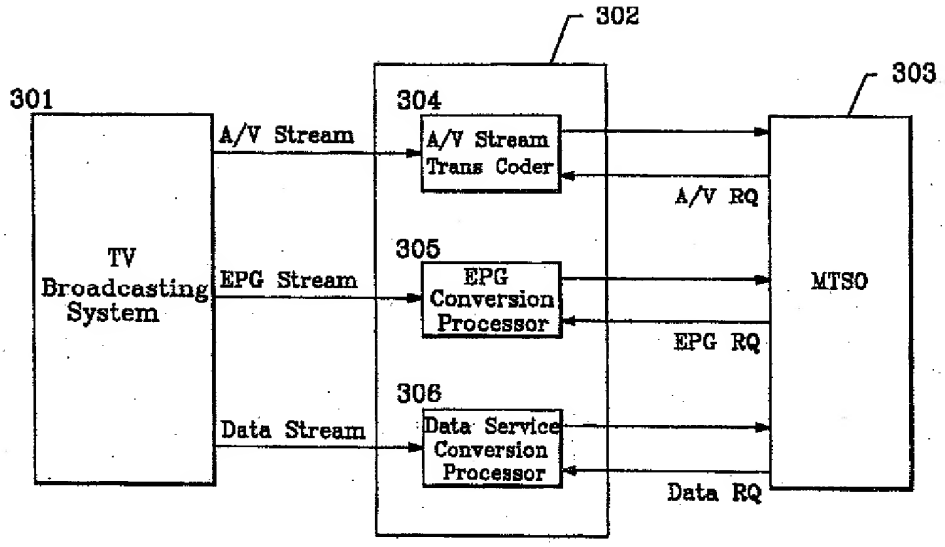

302
303
301
304
A/V Stream
A/V Stream Trans Coder
A/V RQ
TV Broadcasting System
305
EPG Stream
EPG Conversion Processor
MTSO
EPG RQ
306
Data Stream
Data Service Conversion Processor
Data RQ

Fig.4

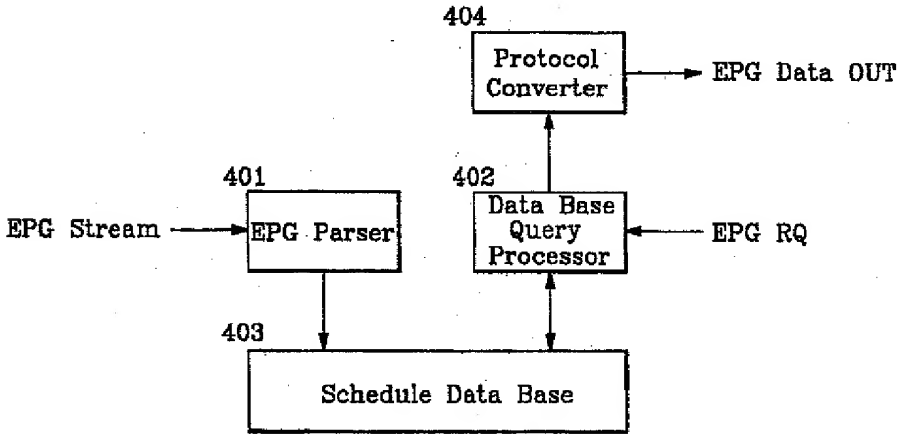

404
Protocol Converter
EPG Data OUT
401
402
EPG Stream
EPG Parser
Data Base Query Processor
EPG RQ
403
Schedule Data Base

Fig.5a

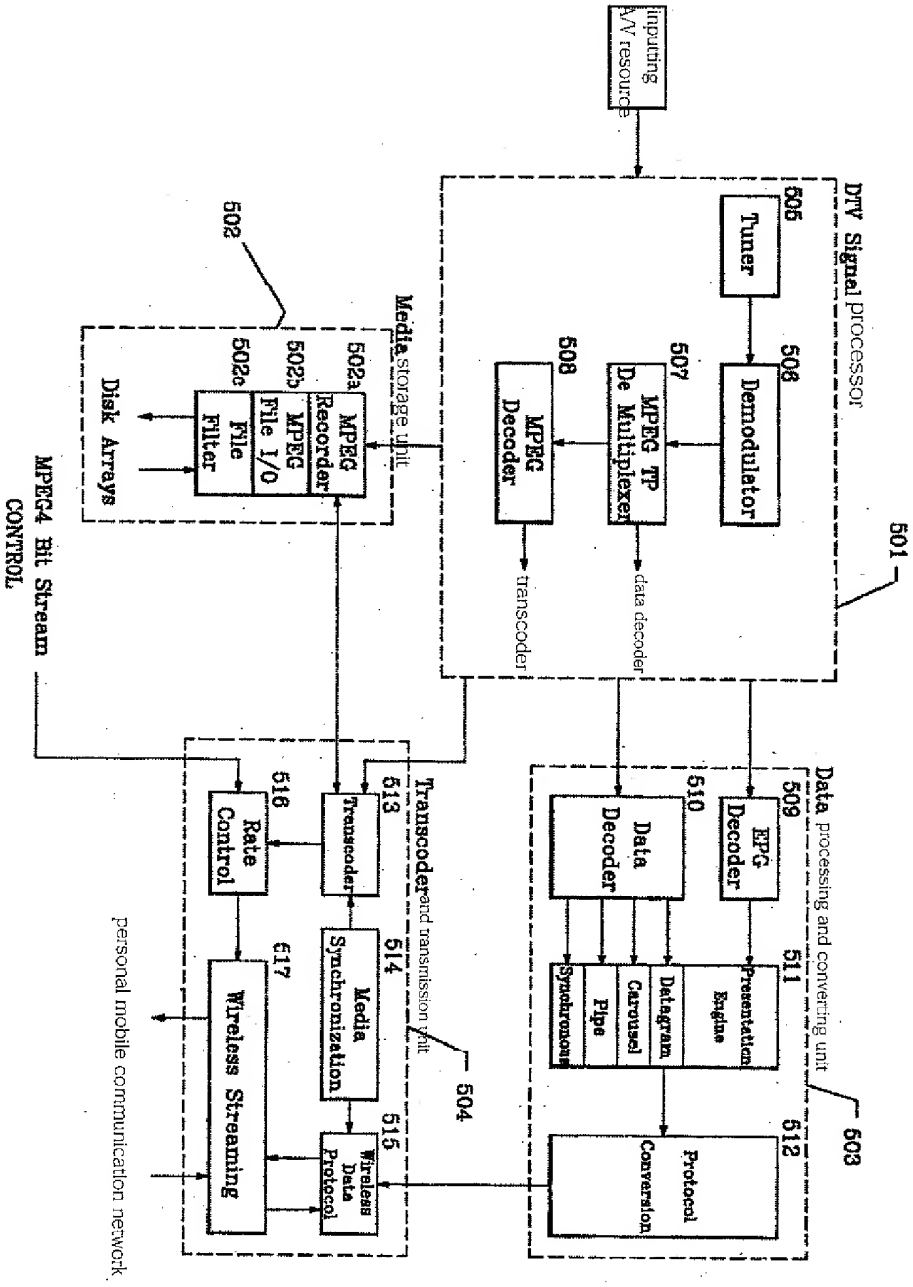

inputting A/V resource
DTV Signal processor
505
Tuner
508
Demodulator
507
MPEG TP De Multiplexer
508
MPEG Decoder
501
transcoder
data decoder
502
Media storage unit
502a
MPEG Recorder
502b
MPEG File I/O
502c
File Filter
Disk Arrays
MPEG4 Bit Stream CONTROL
Data processing and converting unit
509
EPG Decoder
510
Data Decoder
511
Presentation Engine
Datagram
Carousel
Pipe
Synchronous
512
Protocol Conversion
503
Transcoder and transmission unit
513
Transcoder
514
Media Synchronization
515
Wireless Data Protocol
516
Rate Control
517
Wireless Streaming
504
personal mobile communication network

Fig.5b

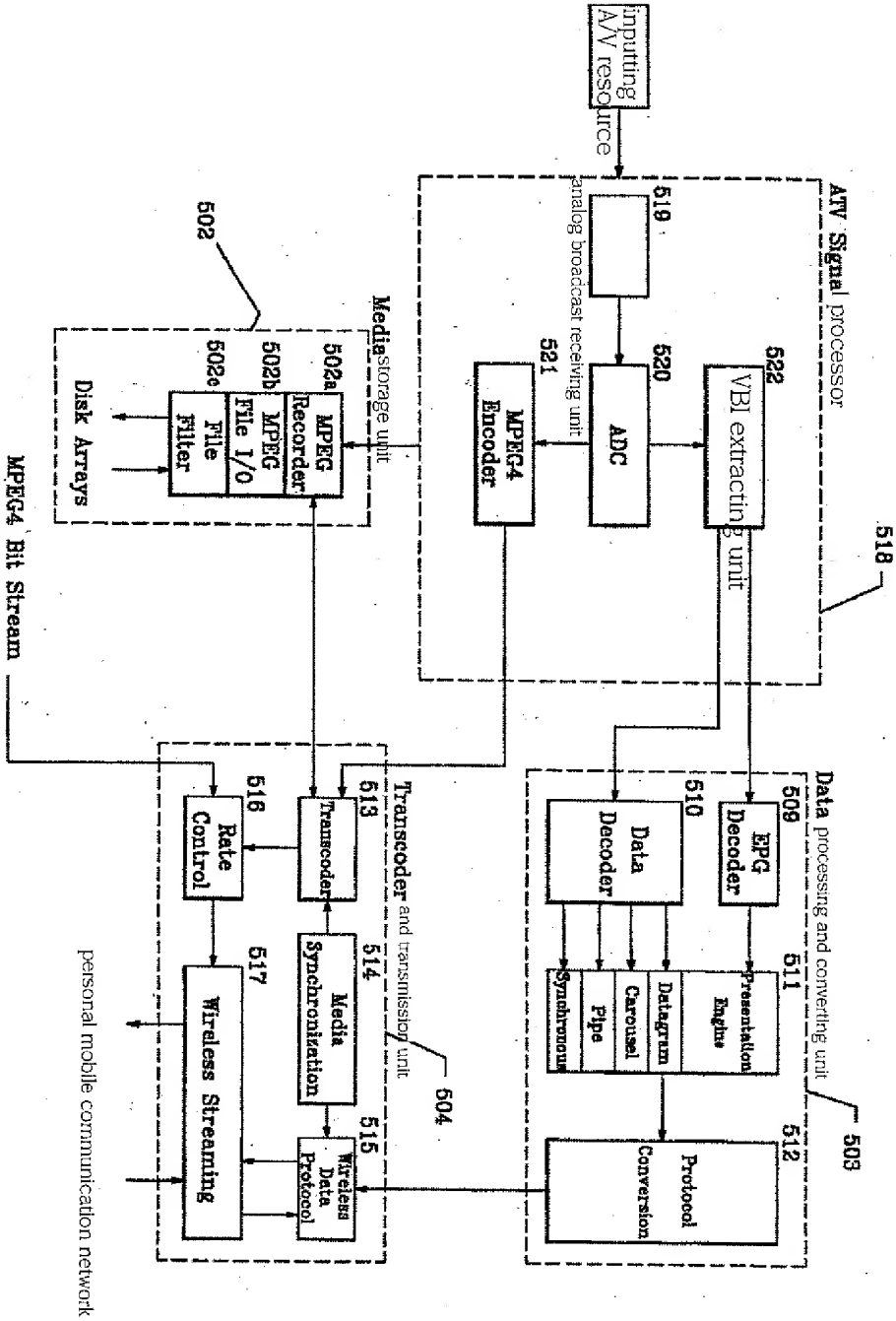

inputting A/V resource
ATV Signal processor
519
analog broadcast receiving unit
521
MPEG4 Encoder
520
ADC
522
VBI extracting unit
518
502
Media storage unit
502a
MPEG Recorder
502b
MPEG File I/O
502c
File Filter
Disk Arrays
MPEG4 Bit Stream CONTROL
Data processing and converting unit
509
EPG Decoder
510
Data Decoder
511
Presentation Engine
Datagram
Carousel
Pipe
Synchronous
512
Protocol Conversion
503
Transcoder and transmission unit
513
Transcoder
514
Media Synchronization
515
Wireless Data Protocol
516
Rate Control
517
Wireless Streaming
504
personal mobile communication network

Fig.6

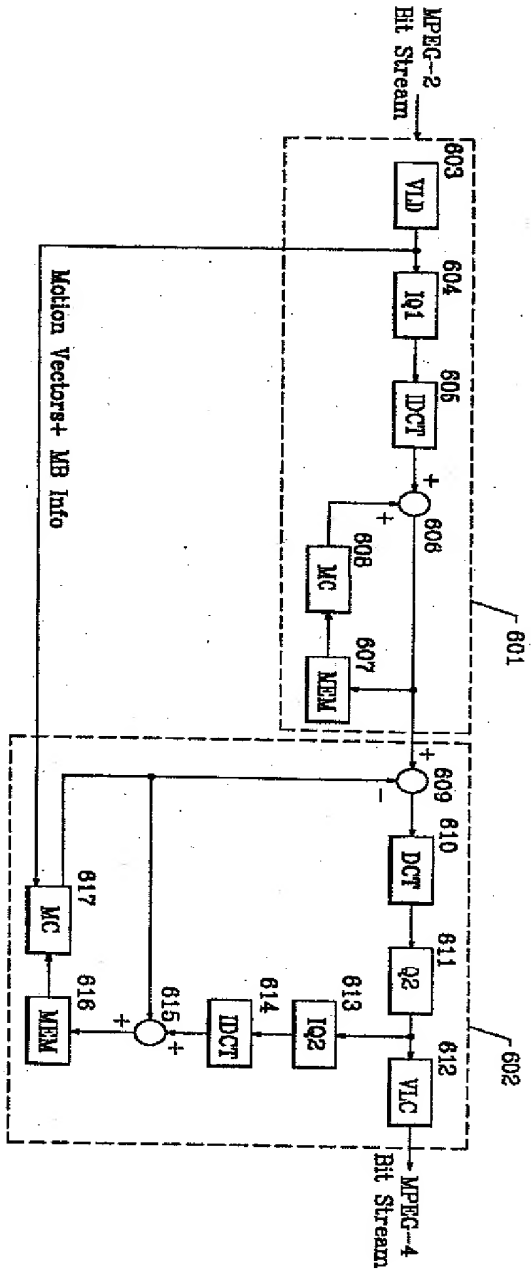

MPEG-2
Bit Stream
603
VLD
604
IQ1
605
IDCT
606
608
MC
607
MEM
601
Motion Vectors+ MB Info
609
610
DCT
611
Q2
612
VLC
602
MPEG-4
Bit Stream
617
MC
618
MEM
615
614
IDCT
613
IQ2

Fig. 7

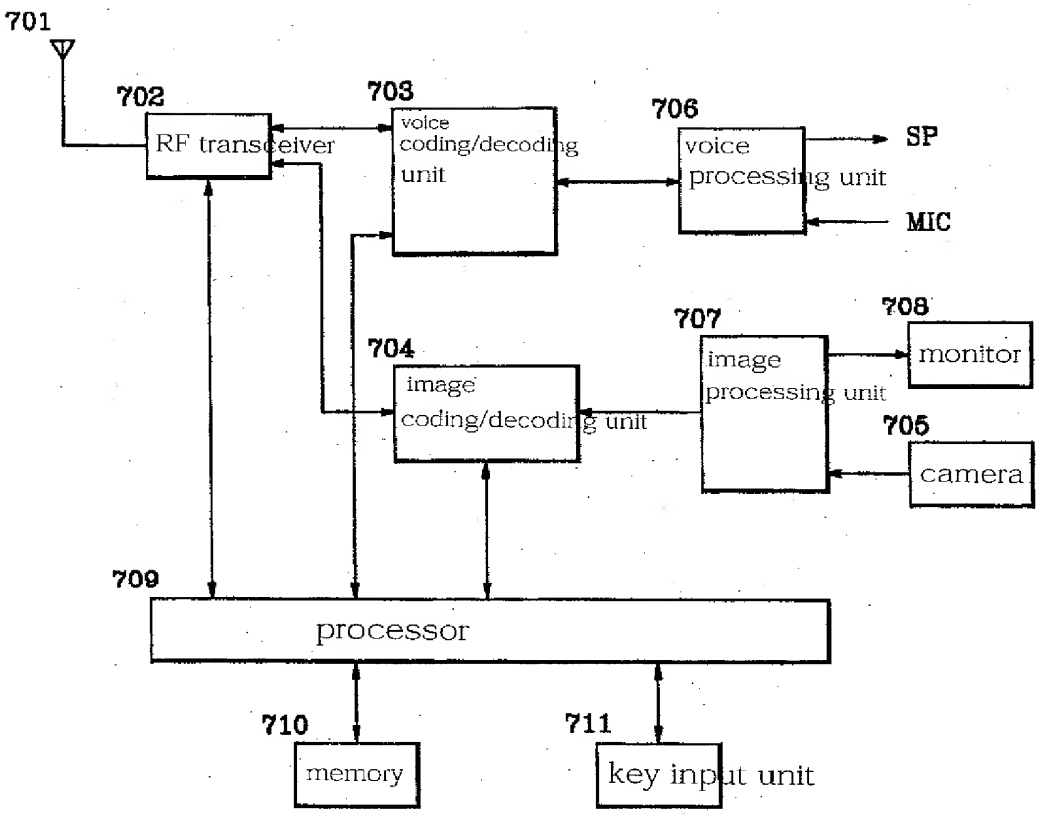
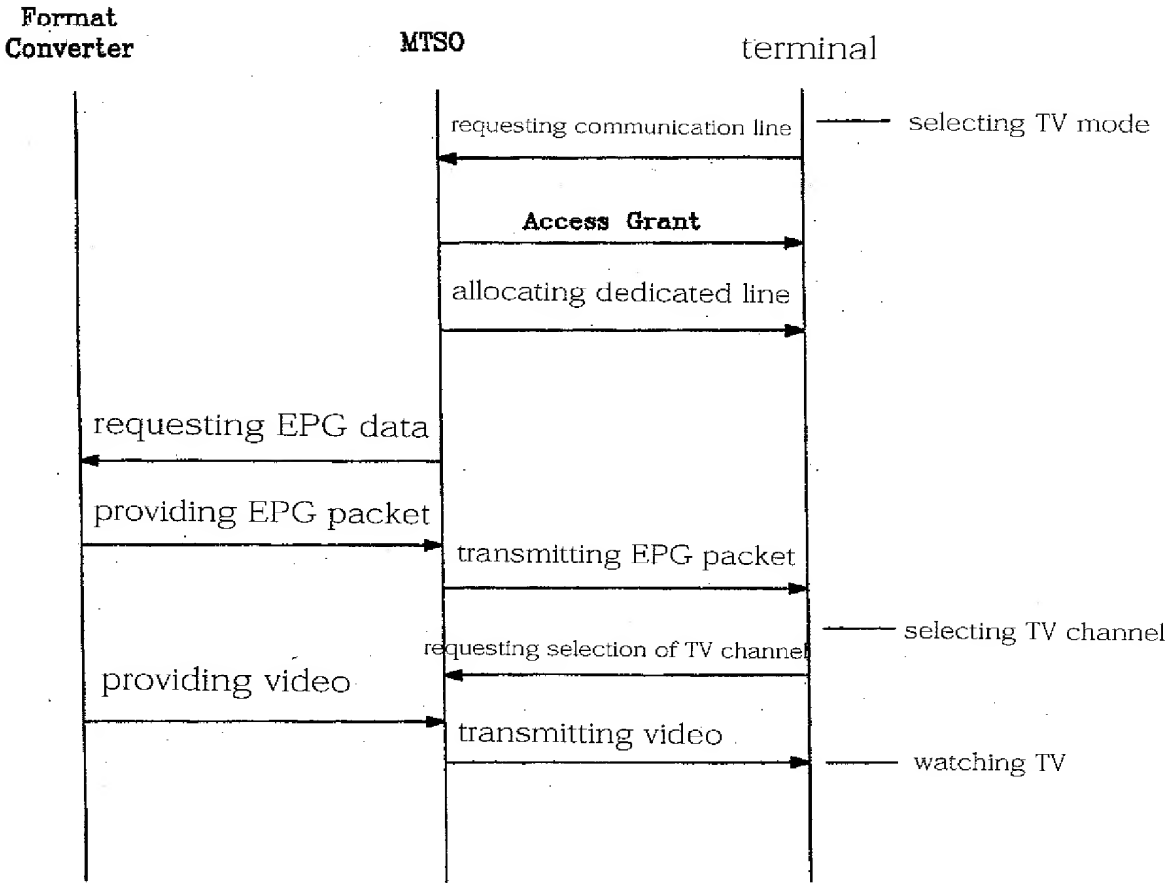

701
702
RF transceiver
703
voice coding/decoding unit
706
voice processing unit
SP
MIC
704
image coding/decoding unit
707
image processing unit
708
monitor
705
camera
709
processor
710
memory
711
key input unit

Fig.8


Format Converter
MTSO
terminal
requesting communication line
selecting TV mode
Access Grant
allocating dedicated line
requesting EPG data
providing EPG packet
transmitting EPG packet
selecting TV channel
requesting selection of TV channel
providing video
transmitting video
watching TV